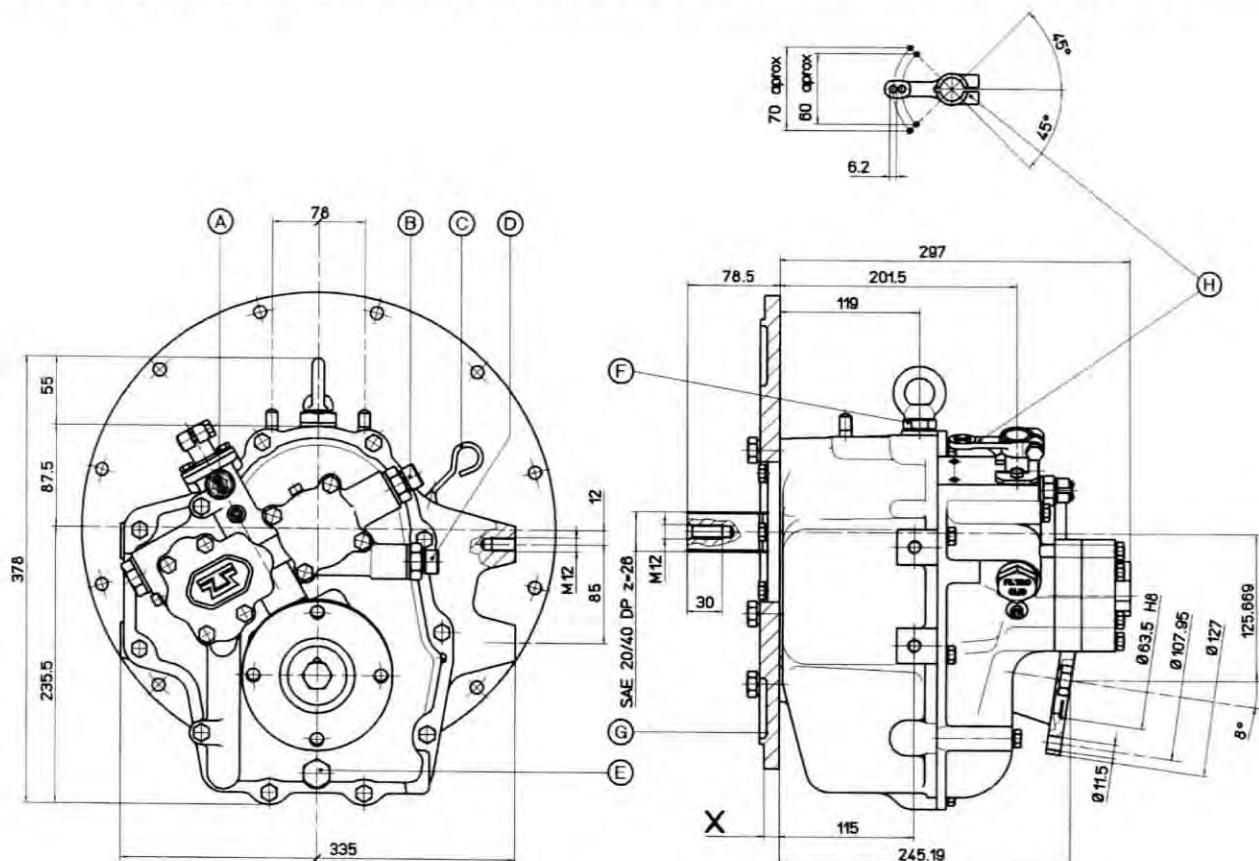


Technodrive

TM93A

service manual



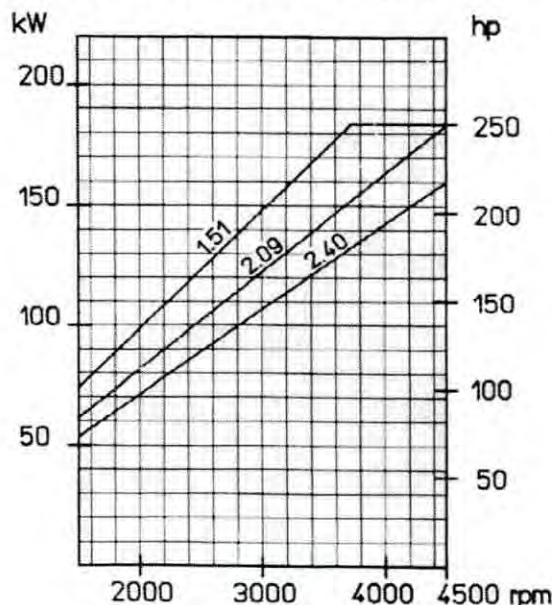


- A – Indicatore di folle – Neutral indicator – Indicateur point mort – Leerlauf Anzeiger – Neutral indicador
B – Ritorno olio da scambiatore – Oil from cooler – Retour huile de l'échangeur – Ölrücklauf vom Kühler - Regreso del aceite del intercambiador (1/2" GAS)
C – Asta livello olio – Oil dipstick – Bouchon de niveau – Ölmeßstab – Varilla del nivel del aceite
D – Mandata olio allo scambiatore – Oil to cooler – Refoulement huile ou échangeur – Ölzulauf zum Kühler – Impulsion del aceite al intercambiador (1/2" GAS)
E – Tappo scarico olio – Oil drain plug – Bouchon de vidange – Ölablaßdeckel – Tapòn de vaciado del aceite
F – Tappo carico olio – Filling plug – Bouchon de remplissage – Einfülldeckel Öl – Tapòn de llenado del aceite
G – Campana – Mounting flange – Cloche – Schwungradgehäuse – Campana: SAE 3, SAE 4 (X=12,5/33), BW (X=13,5)
H – Leva comando – Actuating lever – Levier de commande – Steuerhebel – Palanca de mando

CARATTERISTICHE TECNICHE
TECHNICAL DATA
CARACTERISTIQUES TECHNIQUES
TECHNISCHE DATEN
CARACTERISTICAS TÉCNICAS

Rapporto-Ratio-Rapport- Untersetzung-Relacion	1,51	2,09	2,40
Coppia max – Diporto Max torque – Pleasure Couple maxi – Plaisance Nm Max Drehmoment-Vergnügungsboot Par max – Recreo	470	390	340
Coppia max – Lavoro leggero Max torque – Intermediate duty Couple maxi – Service leggero Nm Max Drehmoment-Leichte Arbeit Par max – Servicio ligero	360	300	260
Velocità max entrata Max input speed Vitesse maxi à l'entrée Max Eingangsgeschwindigkeit Velocidad máx a la entrada	4500 RPM		
Peso a secco Weight without oil Poids sans huile Gewicht ohne öl Peso sin aceite	53 Kg		

DIAGRAMMA DI POTENZA (DIPORTO)
 POWER CURVE (PLEASURE)
 DIAGRAMME DE PUISSANCE (PLAISANCE)
 LEISTUNGSKURVE (VERGNÜGUNGSBOOT)
 DIAGRAMA DE POTENCIA (RECREO)



OPERATING PROCEDURE

- In forward speed motion is transmitted by means of the clutch unit mounted on the input shaft.
- In forward speed, the rotating direction of the marine gear output flange is opposite to engine direction.
- In reverse speed, motion transmission is achieved by means of a clutch unit mounted on the intermediate shaft.
- Clutches are driven by the oil pressure raised by a pump controlled by the intermediate shaft and are able to transmit full power both in forward and in reverse speed.
- The reduction ratio is the same in forward as well as in reverse speed.

INSTALLATION

- TM93-TM93A marine gear can be connected to engine rotating counterclockwise (as seen from the flywheel side) only.
- Before connecting the marine gear output flange to the propeller axle, it is necessary to make sure that its misalignment does not exceed 0,05 mm.
- The remote control must be connected so that the control lever can rotate completely from the forward speed position to the reverse speed position and a correct neutral position can be ensured. From the neutral position, forward speed is achieved by rotating the control lever counterclockwise.
- The heat exchanger connection is achieved as shown in fig.1.
- The marine gear is supplied without oil; therefore, before starting it, fill it up to the maximum level marked on the dipstick; then start the engine to allow the piping system to fill up and check the oil level again

Make sure that the control cable is easily movable.

Make sure that the control cable is able to perform the complete lever stroke both in forward and in reverse and that it is well positioned in neutral.

USE

- The engagement of forward speed and reverse speed and the shifting to neutral position must be carried out while the engine is running at minimum speed.
- ⚠ **The gearbox is supplied without oil. Before the first start-up it must be filled up to the maximum level marked on the dipstick.**
- ⚠ **Before to start the engine make sure that the gearbox is in neutral position.**
The gearbox should only be shifted with the engine at idle speed so as to avoid that the gearbox or the coupling may be damaged.

MAINTENANCE

- Check oil level daily.
- Change the oil for the first time after 50 working hours; afterwards, replace the oil after 1000 working hours (or, at the longest, every 12 months).
- Whenever the oil is replaced, clean the filter (ref.72).
- Clutches require no adjustment.
- ⚠ **Disassembly and assembly of the gearbox or of its parts is to be made by specialized technicians only.**

LUBRICATION

- Use class CD (API service classification) oil SAE 20 W 40.
- Oil quantity for the marine gear with standard cooler: 2,4 l.
- Max oil temperature: 90°C.
- Oil pressure measured at 1000 RPM engine speed, oil temperature 60°C, is to be between 19 and 21 bar.
Pressure gauge connections M6x1 are placed, refer to fig.1, on A (forward) and C (reverse).

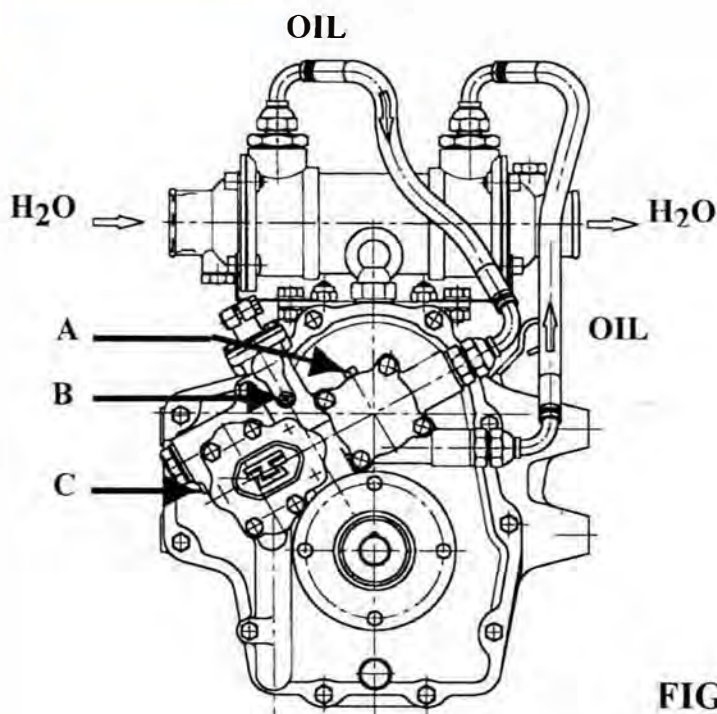


FIG.1

Schema applicazione scambiatore - Attacchi manometri

Exchanger application diagram - Pressure gauge connections

Schema d'application de l'échangeur - Fixations des manomètres

Prese per manometri: M6x1

- A Press. Marcia Avanti
- B Press. Pompa
- C Press. Marcia Indietro

Pressure gauge intakes: M6x1

- A Forward speed pressure
- B Pump pressure
- C Reverse speed pressure

Prises pour manomètres: M6x1

- A Press. Marche-avant
- B Press. Pompe
- C Press. Marche-arrière

GUASTO-FAILURE-DEFAULT	CAUSA-CAUSE-CAUSE	RIMEDIO-SOLUTION-REMEDE
- Pressione olio troppo bassa - Pressione olio troppo alta - Surriscaldamento	- Valvola regolatrice sporca (84) - Livello olio troppo basso - Pompa olio guasta - Anelli di tenuta sugli alberi frizione rotti (21),(45) - Valvola regolatrice sporca (84) - Livello olio eccessivo - Portata acqua di raffreddamento insufficiente - Scambiatore sporco o intasato - La frizione slitta - Eccessivo carico sull'invertitore - Precarico sui cuscinetti non corretto - Cuscinetto danneggiato	- Smontare valvola e pulire - Ripristinare livello - Sostituire pompa - Smontare e sostituire - Smontare valvola e pulire - Portare olio a livello prescritto - Portare al giusto valore - Smontare e pulire - Verificare la pressione dell'olio nel circuito di comando. Se la pressione è troppo bassa regolarla come detto. Se la pressione è normale occorre smontare e sostituire i dischi frizione. - Ridurre la potenza del propulsore - Ripristinare precarico alberi(max 0,08-min.0,02) - Sostituire il cuscinetto
- Too low oil pressure - Too high oil pressure - Overheating	- Dirty bypass valve (84) - Too low oil level - Failure in oil pump - Broken O rings on clutch shaft (21),(45) - Dirty bypass valve (84) - Excessive oil level - Insufficient cooling water intake - Dirty or clogged exchanger - Clutch slipping - Exchanger overload - Incorrect bearing preloading - Damaged bearing	- Remove valve and clean - Restore oil level - Replace pump - Remove and replace them - Remove valve and clean it - Bring oil down to required level - Bring up to correct quantity - Remove and clean - Check oil pressure in the transmission circuit. If the pressure is too low, proceed as indicated above. If pressure is normal, remove and replace clutch plates. - Reduce propulsor power - Reset shaft preloading(max 0,08-min 0,02) - Replace bearing
- Pression d'huile trop basse - Pression d'huile trop haute - Surchauffe	- Vanne de réglage sale (84) - Niveau d'huile insuffisant - Pompe à huile en panne - Cassure des bagues d'étanchéité sur axes embrayage (21),(45) - Vanne de régulation sale (84) - Niveau d'huile excessif - Débit d'eau de refroidissement insuffisant - Echangeur sale ou bouché - L'embrayage glisse - Charge excessive sur l'inverseur - Mauvaise pré-charge sur roulements	- Démonter la vanne et nettoyer - Rétablir le niveau - Remplacer la pompe - Démonter et remplacer - Démonter la vanne et nettoyer - Amener l'huile au niveau indiqué - Amener à la bonne valeur - Démonter et nettoyer - Vérifier la pression de l'huile dans le circuit de commande. Si la pression est trop basse, procéder de la façon indiquée. Si la pression est normale, il faut démonter et remplacer les disques d'embrayage. - Réduire la puissance du propulseur. - Rétablir la pré-charge des axes (max 0.08-min 0,02)

RICAMBI Per ordinare i ricambi specificare il tipo di invertitore, il numero di serie, il rapporto, il numero di riferimento del disegno, la quantità.

SPARE PARTS When ordering spare parts specify the gearbox model, the serial number, ratio, reference number indicated on the drawing and desired quantity.

PIÈCES DÉTACHÉES Pour la commande de pièces détachées, veuillez spécifier le type de 'inverseur, le numéro de série, le rapport, le numéro de rep. du plan ainsi que la quantité.

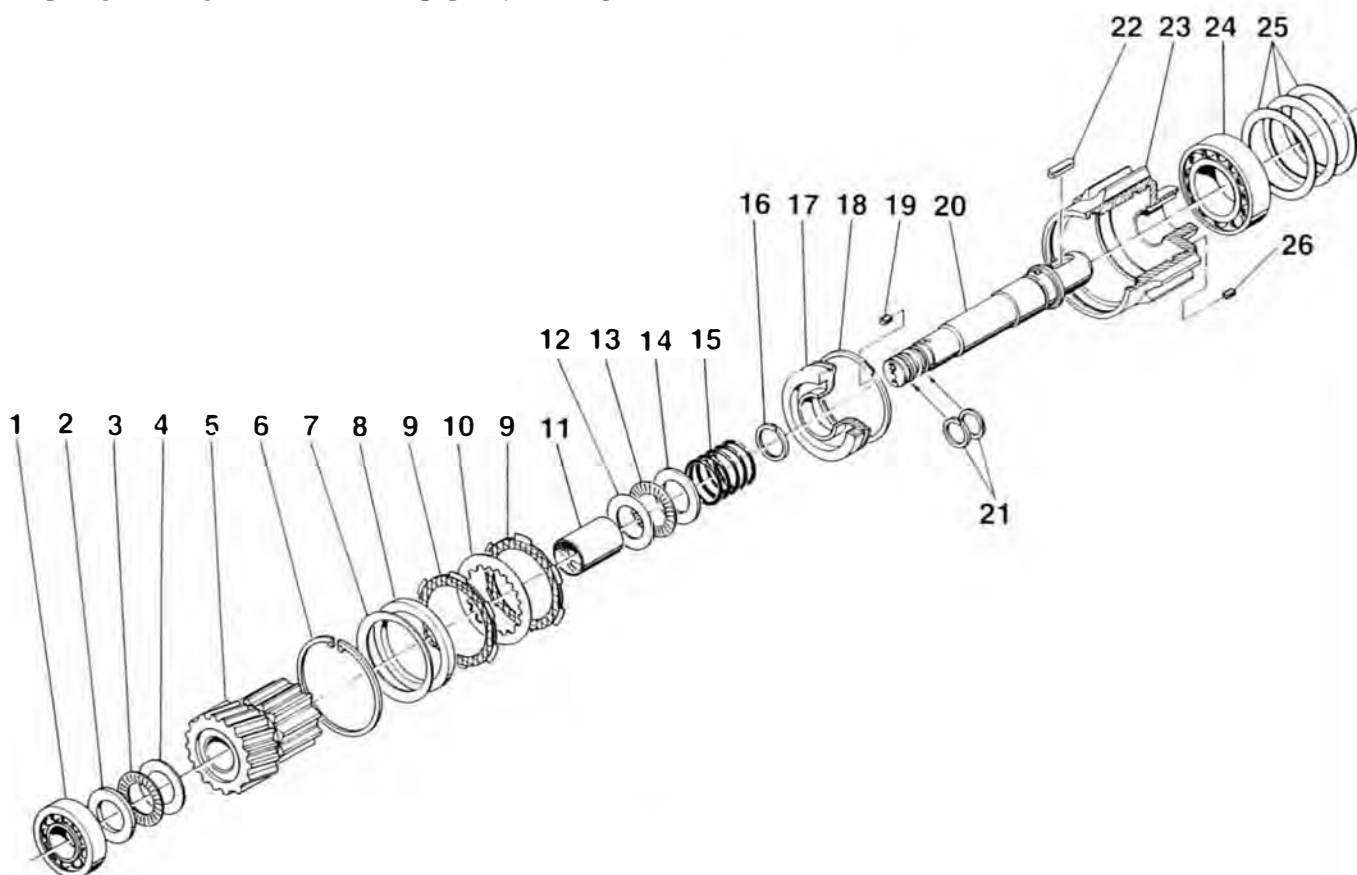
ERSATZTEILE Zum Bestellen von Ersatzteilen den Typ des Wendegetriebes, die Fabriknummer, die Untersetzung, die Bezugsnummer der Zeichnung und die Menge angeben.

REPUESTOS Para pedir los repuestos hay que especificar el tipo de inversor, el número de serie, la relación (ratio), el número de referencia del dibujo y la cantidad.

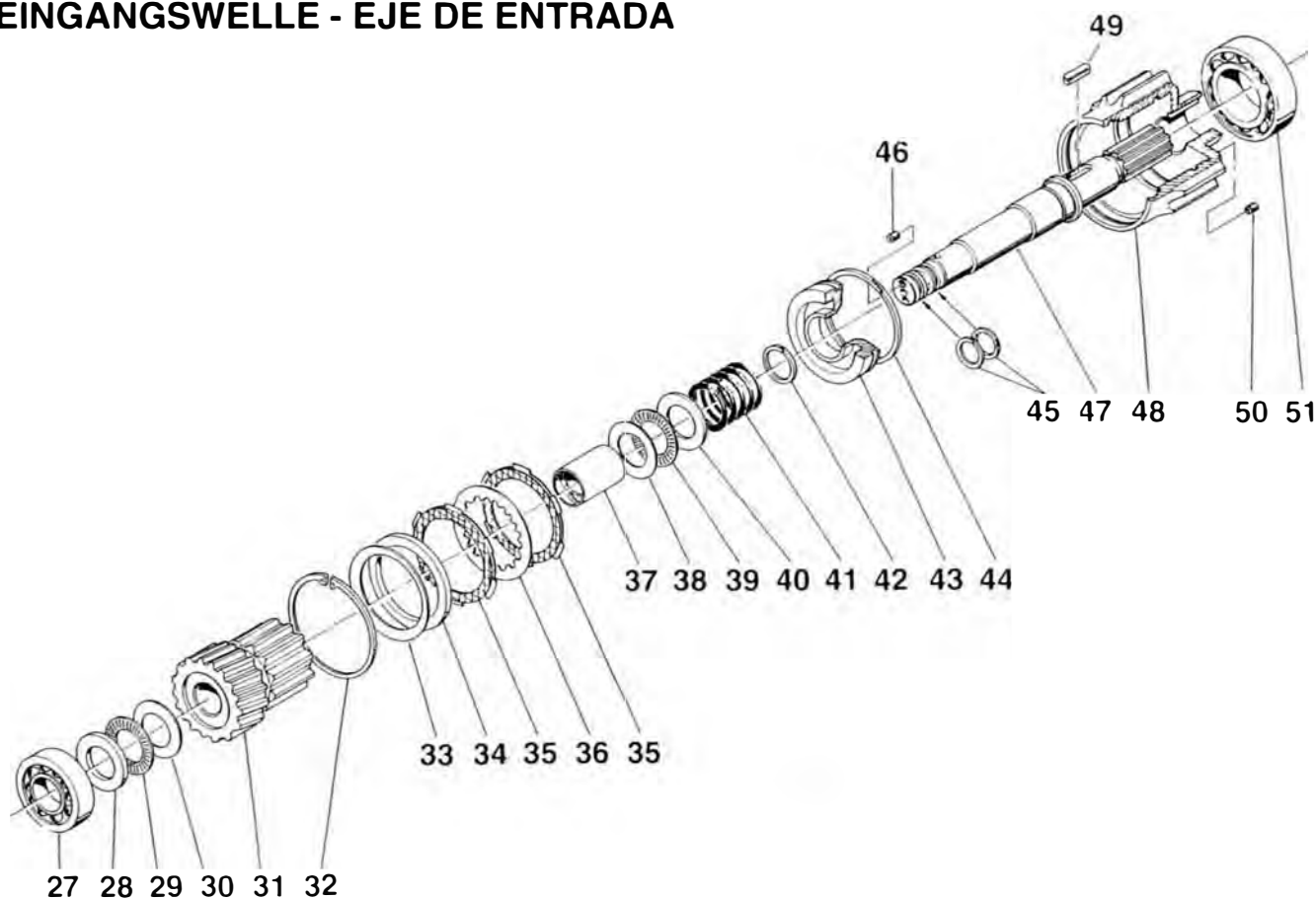
Rif. Ref.	Denominazione Denomination	Quantità Quantity	Codice Code	Rif. Ref.	Denominazione Denomination	Quantità Quantity	Codice Code	
1	Cuscinetto - Bearing	1	4622037	31	Pignone TM93A r 1,51 – Gear TM93A r 1,51	1	2061509	
2	Rasamento - Ring	1	2016019	31	Pignone TM93A r 2,09 – Gear TM93A r 2,09	1	2061507	
3	Cuscinetto reggisplinta – Thrust bearing	1	4607019	31	Pignone TM93A r 2,40 – Gear TM93A r 2,40	1	2061505	
4	Ralla – Thrust block	1	4603022	32	Seeger - Seeger	1	4601095	
5	Pignone TM93 r 1,51 – Gear TM93 r 1,51	1	2061509	33	Molla a tazza - Spring	1	4578010	
5	Pignone TM93 r 2,09 – Gear TM93 r 2,09	1	2061507	34	Disco di ritenuta – Back plate	1	2022053	
5	Pignone TM93 r 2,40 – Gear TM93 r 2,40	1	2061505	35	Disco sinterizzato – Clutch plate	10	2022041	
5	Pignone TM93 r 2,77 – Gear TM93 r 2,77	1	2061503	36	Disco in acciaio – Steel plate	9	2022039	
5	Pignone TM93A r 1,51 – Gear TM93A r 1,51	1	2061515	37	Boccola - Bushing	1	2050022	
5	Pignone TM93A r 2,09 – Gear TM93A r 2,09	1	2061516	38	Ralla – Thrust block	1	4603024	
5	Pignone TM93A r 2,40 – Gear TM93A r 2,40	1	2061514	39	Cuscinetto reggisplinta – Thrust bearing	1	4607019	
6	Seeger - Seeger	1	4601095	40	Ralla – Thrust block	1	4603023	
7	Molla a tazza - Spring	1	4578010	41	Molla ritorno pistone - Spring	1	2020035	
8	Disco di ritenuta – Back plate	1	2022053	42	Fascia elastica – Seal ring	1	2024004	
9	Disco sinterizzato – Clutch plate	10	2022041	43	Pistone - Piston	1	2017011	
10	Disco in acciaio – Steel plate	9	2022039	44	Fascia elastica – Seal ring	1	2024009	
11	Boccola - Bushing	1	2050022	45	Fascia elastica – Seal ring	2	2024007	
12	Ralla – Thrust block	1	4603024	46	Tappo conico - Plug	1	4588006	
13	Cuscinetto reggisplinta – Thrust bearing	1	4607019	47	Albero primario – Input shaft	1	2021377	
14	Ralla – Thrust block	1	4603023	48	Campana frizione – Clutch housing	1	2061500	
15	Molla ritorno pistone - Spring	1	2020035	49	Chiavetta – Key	1	4620054	
16	Fascia elastica – Seal ring	1	2024004	50	Tappo forato – Plug	1	2055036	
17	Pistone - Piston	1	2017011	51	Cuscinetto – Bearing	1	4622073	
18	Fascia elastica – Seal ring	1	2024009	52	Cuscinetto – Bearing	1	4622052	
19	Tappo conico - Plug	1	4588006	53	Corona-Gear	TM93 r 1,51	1	1012001
20	Albero di rinvio – Intermediate shaft	1	2021378	55	Albero-Shaft			
21	Fascia elastica – Seal ring	2	2024007	56	Chiavetta-Key			
22	Chiavetta - Key	1	4620054	53	Corona-Gear	TM93 r 2,09	1	1012002
23	Campana frizione – Clutch housing	1	2061500	55	Albero-Shaft			
24	Cuscinetto - Bearing	1	4622073	56	Chiavetta-Key			
25	Distanziale - Spacer	x	2013189	53	Corona-Gear	TM93 r 2,40	1	1012003
26	Tappo forato - Plug	1	2055036	55	Albero-Shaft			
27	Cuscinetto - Bearing	1	4622037	56	Chiavetta-Key			
28	Rasamento - Shim	1	2016019	53	Corona-Gear	TM93 r 2,77	1	1012004
29	Cuscinetto reggisplinta-Thrust bearing	1	4607019	55	Albero-Shaft			
30	Ralla – Thrust block	1	4603022	56	Chiavetta-Key			
31	Pignone TM93 r 1,51 – Gear TM93 r 1,51	1	2061509	53	Corona-Gear	TM93A r 1,51	1	1012011
31	Pignone TM93 r 2,09 – Gear TM93 r 2,09	1	2061507	55	Albero-Shaft			
31	Pignone TM93 r 2,40 – Gear TM93 r 2,40	1	2061505	56	Chiavetta-Key			
31	Pignone TM93 r 2,77 – Gear TM93 r 2,77	1	2061503					

Rif. Ref.	Denominazione Denomination	Quantità Quantity	Codice Code	Rif. Ref.	Denominazione Denomination	Quantità Quantity	Codice Code	
53	Corona-Gear	TM93A r 2,09	1	1012012	99	Prigioniero - Stud	2	4617081
55	Albero-Shaft				100	Paraolio – Oil seal	1	4596111
56	Chiavetta-Key				101	Coperchio asse entrata - Cover	1	2010238
53	Corona-Gear	TM93A r 2,40	1	1012013	102	Rondella elastica - Washer	6	4611108
55	Albero-Shaft				103	Vite - Screw	6	4615214
56	Chiavetta-Key				104	Coperchio - Cover	1	2010240
54	Guarnizione OR – “O” Ring	1	4598127	105	Vite - Screw	8	4615138	
57	Cuscinetto – Bearing	1	4622046	106	Asta livello olio - Gauge	1	2070049	
58	Vite – Screw	4	4615238	107	Scatola TM93 – Housing TM93	1	2009072	
59	Rosetta elastica – Washer	4	4611108	107	Scatola TM93A – Housing TM93A	1	2009073	
60	Coperchio pompa – Cover	1	2010330	108	Paratia – Bulkhead	1	2026007	
61	Boccola – Bushing	2	4584002	109	Tubo - Tube	1	2042044	
63	Spina cilindrica – Dowel pin	2	4614013	110	Vite - Screw	2	4615202	
64	Tappo chiusura filtro olio – Plug	1	2055037	111	Raccordo - Nipple	1	4624002	
65	Boccola - Bushing	2	4584002	112	Rondella piana - Washer	1	4609030	
66	Coperchio pompa - Cover	1	2010331	113	Spina cilindrica – Dowel pin	2	4614012	
67	Rondella - Washer	1	4609028	114	Coperchio TM93 – Cover TM93	1	2010233	
68	Vite - Screw	1	4615129	114	Coperchio TM93A – Cover TM93A	1	2010234	
69	Sfera - Ball	1	4630020	115	Rondella elastica – Washer	9	4611108	
70	Molla - Spring	1	2020045	116	Vite – Screw	9	4615214	
71	Seeger - Seeger	1	4601017	117	Rondella piana – Washer	1	4609015	
72	Filtro olio – Filter	1	2056039	118	Tappo scarico olio – Drain plug	1	4588034	
73	Rondella - Washer	2	4609007	119	Vite – Screw	1	4615246	
74	Coperchio - Cover	1	2010237	120	Coperchio – Cover	1	2010239	
75	Vite - Screw	1	4615129	121	Rondella elastica – Washer	4	4611108	
76	Vite - Screw	1	4615253	122	Vite – Screw	4	4615214	
77	Piastrina - Plate	1	2054024	123	Rondella elastica – Washer	4	4611108	
78	Rosetta elastica - Washer	2	4611106	124	Vite - Screw	4	4615214	
79	Vite - Screw	2	4615134	125	Paraolio – Oil seal	1	4596165	
80	Guarnizione OR – “O” Ring	1	4598016	126	Flangia uscita – Output flange	1	2062233	
81	Leva di comando – Lever	1	2037036	127	Rosetta di fermo - Washer	1	2014072	
82	Vite - Screw	1	4615214	128	Spina elastica - Pin	1	4613004	
83	Stelo distributore – Selector valve	1	2056072	129	Rosetta elastica - Washer	1	4611114	
84	Valvola - Valve	1	2056073	130	Vite - Screw	1	4615426	
85	Molla - Spring	1	2020056	131	Ingranaggio condotto pompa – Pump gear	1	2061456	
86	Molla - Spring	1	2020055	132	Ingranaggio conduttore pompa – Pump gear	1	2061446	
87	Tappo - Plug	1	4587022	133	Rondella elastica - Washer	3	4611108	
88	Vite - Screw	1	4615129	134	Vite – Screw	3	4615229	
89	Rondella - Washer	1	4609007					
90	Rondella piana - Washer	1	4609030					
91	Raccordo - Nipple	1	4624002					
92	Gruppo valvola by pass – By pass valve	1	1036001					
93	Rondella piana - Washer	1	4609011					
94	Tappo di sfiato - Breather	1	2055032					
95	Rondella piana - Washer	1	4609011					
96	Golfare - Eyebolt	1	4642010					
97	Tappo - Plug	1	2055033					
98	Rondella piana - Washer	1	4609021					

ALBERO DI RINVIO - INTERMEDIATE SHAFT - ARBRE DE RENVOI VORGELEGEWELLE - CONTRAEJE



ALBERO DI ENTRATA - INPUT SHAFT - ARBRE D'ENTREE EINGANGSWELLE - EJE DE ENTRADA



**ALBERO DI USCITA - OUTPUT SHAFT - ARBRE DE SORTIE
AUSGANGSWELLE - EJE DE SAIDA**

